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USSR Report

MACHINE TOOLS AND METALWORKING EQUIPMENT

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UTILIZATION OF NEW NC MACHINE TOOLS, ROBOTS REVIEWED

Baku VYSHKA in Russian 22 Nov 85 p 2

[Article by K. Manafov: "What is the Output of New Equipment? Certain Problems in the Use of NC Machine Tools and Robotized Technological Complexes"]

[Text] At a meeting of the "Soyuzneftemash" Association's council of directors, questions were discussed of the status of introducing NC machine tools and increasing their efficiency at petroleum machinebuilding plants. Unlike at other meetings, this time there were present not only directors of the enterprises, but also the chief engineers and chief technologists who were concerned directly with the introduction of NC machine tools and robotized technological complexes (RTK -- NC machine tool in a set with an automatic manipulator).

The question was posed at the proper time. The situation is that in the 12th Five-Year Plan period, it is planned to change the existing composition of technological equipment radically. Expecially noticeable will be the change in the composition of metal-cutting machine tools. Low-productivity machine tools with manual control will be replaced by more progressive and high productivity machines. It is planned to introduce 1000 NC machine tools alone, as well as 150 robotized technological complexes, 50 machining centers and flexible production modules, 35 automatic lines and two flexible automatic sections. The ratio of progressive types of equipment in basic production will increase from 25 to 60 percent. It is precisely because of this that the volume of industrial output in the association as a whole in the 12th Five-Year Plan must increase by 44 percent without an increase in the number of workers. There is also the problem of essentially increasing the quality and reliability of the equipment manufactured for petroleum fields. Moreover, without the wide introduction of new equipment and technology, the sharp increase in the productivity of labor is impossible.

One specific measure that makes it possible to increase the output of products and improve their quality with a minimal number of workers is the wide introduction of NC machine tools and robotized technological complexes. In fact, as compared to their predecessors (universal machine tools with manual control), their productivity will increase 1.5 to 2-fold. For example, the labor-intensiveness of machining one spline shaft of pipe carriers at the Baku Machinebuilding Plant imeni Lenin on a universal machine tool with manual control was 18 minutes. A change in its manufacture to the NC machine tools reduced labor-intensiveness to almost half.

Labor-intensiveness of manufacturing was reduced greatly for other parts -- gears, intermediate and driven shafts of gear boxes manufactured at the same plant. This enterprise used NC machine tools that manufacture over 50 items and type-sizes of parts. NC machine tools introduced at the "Bakinskiy rabochiy," Plant and imeni leyt. Shmidt, imeni B. Sardarov and imeni Kirov plants had a great effect.

This type of progressive equipment also has other advantages. NC machine tools increase manufacturing accuracy, need less time for readjustment and, the main thing, it is possible to service several machine tools at the same time.

The use of NC machine tools and robotized technological complexes will make it possible to solve a number of social problems -- improve labor conditions for tool machine operators and have a less acute labor shortage (because of multi-machine tool servicing and mechanization). At present, NC machine tools and robotized technological complexes are already in operation at the following plants: imeni Kirov, "Bakinskiy rabochiy" imeni Lenin, imeni Dzerzhinskiy, imeni B. Sardarov and the KMZ. So far only nine plants have begun to master this latest equipment. In the very near future, it is also planned to introduce NC machine tools and RTK [Robotized Technological Complexes] in other plants of the association.

Before the end of 1985, the new equipment plan foresees the introduction of 41 NC machine tools and five RTK at plants of the association. This is almost double that introduced in four years of the 11th Five- Year Plan period. More NC machine tools and RTK will be introduced in 1986, and introduction will increase sharply in the following years.

Are the plants of the association ready for the introduction and efficient utilization of such a quantity of the latest equipment? How is the available equipment utilized and what problems do machine builders face? To obtain answers to these and other questions related to the introduction and efficient utilization of NC machine tools, it was necessary to visit plants of the association and talk to workers, specialists and managers.

The Machinebuilding Plant imeni Lenin is one of the first of the enterprise of the association which began to introduce NC machine tools which have been manufactured domestically since 1978. Here, for the first time, there were trained qualified personnel programers, electronic worders and operators. A specialized NC section was organized. Nine modern, high productivity machine tools were installed in the section. Five more NC machine tools of the first generation were installed in the old machine shop along with other machine tools. But these were only the first steps.

It is planned to expand the NC machine tool section further. In 1986, it is planned to introduce several RTK, machining centers and new generations of NC machine tools. It was found, however, that even here not everything is ready for working with new equipment.

There are many problems without whose solutions in the shortest possible time it will be impossible for machinebuilders to proceed. It is entirely impermissible that in the light of today's requirements NC machine tools at the specialized section operate without full loads. Thus, the section operates in general only one shift and is locked up for the second shift. But even in the first shift not all machine tools are in operation. For example, three machine tools stood idle for more than three months due to the lack of spare parts such as plates and step motors. The start-up of two new motors was delayed because of the late arrival of a representative from Odessa to do some start-up adjusting work. Actually of the nine machine tools in the section, only four are in operation so far. Is this not wasteful? It is alarming that there is no hurry to organize two-shift operation of this highly efficient equipment at the enterprise.

"One of our problems is the timely start-up and adjustment of NC machine tools," stated Kh. Abramov, chief engineer of the imeni V. I. Lenin Plant. "The republic does not have the necessary start-up adjusting organization, therefore, we must conclude contracts with specialized organizations in Odessa, Tbilisi and other cities, depending upon the machine tool models. And that takes time..."

Another problem arises in the process of the operation of the machine tools. For example, a control board on some other electronic part of the machine tool fails. This means idle time. We cannot manufacture the parts ourselves, yet we have nothing to replace them. The only way out is to go to Moscow, Ryazan or Minsk, where these machine are made and "shake out" spare parts there. The Plant ineni Lenin is not the only one that faces this problem. At the "Bakinskiy rabochiy" they showed me an NC lathe in the section that was made by the Ryazan Machine Tool Plant.

"It stood idle for several months waiting for spare parts -- the same board," stated V. Palatov, chief technologist. We sent a man to Ryazan to replace the defective board. But cooperative machine tool builders receive control cabinets from other specialized plants so that one cannot find and replace the board immediately. This takes much money and time."

K. Kuliyev, chief engineer of this plant added that it is necessary to send specialists not only to Ryazan to get the board,but also to Moscow and other cities, otherwise the expensive machine tool would stay idle.

I saw similar scenes also at other enterprises -- the Kishlinsk Machinebuilding Plant, the plants imeni Kasimov, imeni Montin and imeni B. Sardarov. Placing machine tools in operation takes several months, sometimes up to a year, and the idle times are inadmissibly long because there are no spare parts.

In every plant visited everywhere the same thought was expressed: it is necessary to organize a centralized service for servicing and repairing NC machine tools and RTK in the republic.

The USSR Ministry of the Machine Tool and Tool Industry was able to organize such services in Moscow, Minsk, Odessa and other cities in the country. Is it not about time to have such services in our republic?

The management of "Soyuzneftemash" posed this question many times before higher-ranking organizations. Thus, deputy chief of the "Soyuzneftemash" Association, S. Kuliyev, informed us that the ministry is considering this question.

There are also internal problems. These are to train personnel, supply NC macine tools with intermediate products made by using low-waste technology, provide material incentives to engineers and technicians and to efficiently utilize this kind of equipment.

All machinebuilding enterprises have metalworking engineers-technologists. Nevertheless, they must be trained to prepare control programs and handle new generations of NC machine tools and RTK.

The experience of the "Bakinskiy rabochiy" Plant merits attention. Here, young engineers were trained to program and handle electronics at the best enterprises in the country. Upon returning to their own enterprises they began to train their comrades. Thus, personnel was trained at the plant to work on NC machine tools and, as a result, their two-shift operation was organized.

Recently, by a joint decree of the Gosplan of the republic, the AzSSR Academy of Sciences, and Ministry of Higher and Secondary Special Education of the republic, a scientific-educational center "Robots, Robot-Technological Systems and GAP" was organized at AzINEFTEKHIM imeni M. Azizbekov. Its purpose is to train and requalify workers of industrial enterprises to service equipment with electronic devices. Now these enterprises, including plants and organizations of the "Soyuzneftemash" prepare project plans and retrain workers. It is expected that the newly organized center will help machinebuilding enterpises train skilled personnel. It is our opinion that it is necessary to create a good experimental base with NC machine tools and RTK in technical vuz, especially at the AzPlanning Institute imeni Ch. Ildrym.

"So far the training of service personnel to service NC machine tocls and RTK is proceeding slowly," stated S. Kuliyev. "Technical schools and their teachers have difficulties at present. They do not have a base with NC machine tools. We expect to help them in this matter. We plan to supply them with machine tools for training. Our sector institute, the VNIIPTneftemash" will provide help in solving organizational questions.

The efficient utilization of NC machine tools also depends greatly on their being supplied with intermediate products made by low-waste technology. Regrettably there are still many cases where the latest machine tools with electronic devices machine intermediate products with large tolerances. As a result, a large amount of metal goes to chips and the machine tool gets out of order.

In recent years a trend was observed in the association that when machining production develops at a high rate, the intermediate product lags. A large part of the forge-press equipment at the KMZ, plant imeni leyt. Shmidt, imeni B. Sardarov and others is worn out and requires replacement. It is necessary to accelerate the reequipment of casting and forging production.

Finally, it is necessary to introduce the brigade system of wages and organization of labor in sections where NC machine tools are being introduced. This will increase the responsibility of everyone who is involved in their introduction and servicing and the material incentive of workers who are mastering NC machine tools and RTK will increase.

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INDUSTRY PLANNING AND ECONOMICS

QUALITY OF NEW NC MACHINE TOOL CRITICIZED

Moscow SOTSIALISTICH SKAYA INDUSTRIYA in Russian 1 Dec 85 p 2

[Article by V. Vasilyeva (Moscow-Leningrad): "Before The Flywheel Gets Going..."]

[Text] Viktor Petrovich Bondarev, chief engineer of the "Krasnyy proletariy" Plant with whom I spoke about the reliability problems of NC systems, described the situation in one sentence:

"Machinebuilders complain about instrument builders, while they complain about electronics people...:

I recalled a recent episode in one of the shops of the Kaluga Machinebuilding Plant. The director of the plant, demonstrating a new NC lathe, pointed at an old, universal lathe standing beside it.

"We keep it for insurance," he explained, "the new one is not very reliable."

Time has passed when NC machine tools were perceived as exotic novelties, when they were condenscendingly forgiven for frequent stoppages -- they did not determine the weather. Today the weather is made by equipment controlled by electronics. The rates of electronics production grow extremely rapidly and the requirements for modern NC systems increase as fast.

As frequently happens, a sharp quantiative increase emphasizes the problem of quality more sharply. Now, when NC machine tools are being made not in the hundreds but in the many thousands per year, foremost on the agenda of the day are the problems of the efficiency and reliability of NC machine tools. The Moscow "Krasnyy proletariy" has become very closely involved in this problem. This year it changed fully to the production of NC machine tools and industrial robots. The program is being implemented with difficulty: several systems are rejected every day at the quality control department which consists of up to 20 people. The ratio of acceptable systems does not exceed 60 to 70 percent. Because of the lack of parts to assemble them, dozens of machine tools cannot be shipped to users.

The situation is made more acute by the fact that the Minpribor [Ministry of Instrument Building, Automation Equipment and Control Systems], the head ministry of the production of NC systems, is unable to cope with the volume indicators at present.

"Until this year, we grew gradually and added 20 to 30 percent annually." said V. Ganzhula, deputy chief of the "Soyuzchetmash" VPO [All-Union Production Association] in explaining the situation. "In 1985 we were asked for a sharp sudden change -- to increase production of the system 1.7-fold."

The instrument builders received this requirement literally like snow falling in June. Measures were taken as if for a fire: to the two enterprises that had already mastered this production, the "Leningrad Electromechanical Plant, and the Tomsk "Kontur" Plant, five more plants were urgently joined for the production of new products without a stockpile of semifinished products and even without the required quality control equipment. Yet, about 30 percent of the sector's program was laid upon them. It is, therefore, not surprising that tasks are not being fulfilled and manufacturing quality has deteriorated. To save the situation somehow, the Moscow "Energopribor" Experimental Plant organized additional quality control of the NC systems,which were received from plants at Nalchik, Smolensk, Luben and Nevinnomyssk,before shipping them to the "Krasnyy proletariy." Before the day I visited the "Krasnyy proletariy," of the 28 systems that went through this intermediate inspection, only six were found to be acceptable.

Hearing V. Ganzhula's explanations, one would think that the "Soyuzschetmash" specialists are ignorant of the trends in the world's machinebuilding and of the decrees of the party and government on machinebuilding questions that show clear landmarks for the future in building electronic equipment. Having armed themselves with "objective" reasons, V. Ganzhula, along with K. Bortsova, chief of the VPO planning department, formed a circle of defense which distributed the guilt in the created situation among machinebuilders who prolong the coordination of planned tasks, and electronics people who supply an unreliable component base. Here they themselves were found to be in the situation of some passive transfer link. Speaking straight, such a position does not agree with the role of a head organization which has the entire responsibility for developing and producing NC systems and for their technical standards and qualities.

By the way, the Minpribor also understands the inconsistency of this position. Ye. Smirnov, deputy minister, stated:

"Instead of dictating technical policy to the supplier, we have walked all these years in the wake of the electronics industry; we took what was given us while the low quality of the component base was covered as though by a fig leaf..."

This has led to NC devices that are manufactured by the Minpribor today which do not meet the requirements of the variety of products of domestic machinebuilding. Schedules of development and the creation of new systems are prolonged for many years, and leads to their technical standards constantly lagging behind those abroad. Yet, in its time, almost 30 years ago, an NC lathe, the first in the world's practice, won the grand prize at the World Exhibition in Brussels.

Lost positions are a direct consequence of organizational miscalculations. We will start with the fact that the Minpribor has not even one enterprise specializing entirely in the production of NC systems. Even the LEMZ [Leningrad Electromechanical Plant], which was made the head organization in the production of this product in the sector, is literally exhausted by the heaviest load in the program in the production of three-phase counters. The initial idea of converting this enterprise into an "NC city" remained unrealized. I was shown a long list of facilities whose construction should have been completed, but not one facility has even been started.

Thus, the LEMZ was found to be completely unprepared to increase the output of these products. Its management tried to solve this problem by quantitative growth at the expense of a reduction in qualitative parameters.

At a meeting the buro of the Leningrad party obkom, where the question was discussed about the grave shortcomings in the operation of the LEMZ economic managers and the partcom, N. Smirnov, chief designer of the Minpribor on NC systems and deputy director of the VNIKI [All-Union Scientific Research and Design Institute] NC, was asked:

"Why did you not resist the output of poor quality products?"

"We were short on principle," Nikolay Alekseyevich acknowledged frankly.

To a great degree this also reflected the lack of single technical policy in the area of NC systems which led to an unjustifiable multiplicity of their designs. "Here we have a real zoo," I was told at the ENIMS [Experimental Scientific Research Institute of Metal-Cutting Machine Tools], as I was shown a section of domestic NC equipment,"no system standardization whatever!" One does not need to go far. In the VNKI NC -- the head institute itself! -- various laboratories issue various versions of designs, or as N. Smirnov expresses it, "they are being original!" It is well known that a lack of standardization means a reduction in the reliability of the systems and additional difficulties in creating and servicing NC machine tools.

In a word, the entire complex of problems related to the production of NC devices has reached a peak today and demands a radical rebuilding in organizational as well as in technical policy. How does the Minpribor implement this rebuilding? The main emphasis is on reorganizing the LEMZ into a large scienrific research organization in which two additional institutes and a plant were included. The new organization was given larger scale problems -- the creation of NC devices for machine tools and robots with the possibility of their operation in flexible automatic productions. The management of the organization was strengthened by the appointment of P. Radchenko as general director. He is an experienced manager. Operational measures are being taken to improve the technology of NC system production. A specialized building has been built for that at the Kursk "Schetmash" Plant. In other words, the flywheel whose start-up was delayed by the Minpribor for at least several years has begun to turn. Now the entire question is when can the output be expected. Instrument builders are more or less optimistic.

But at the Board of the Ministry of the Machine Tool and Tool Industry, we heard Minister B. Balmont ask N. Smirnov, chief designer of NC systems who was invited to the meeting of the Board:

"What can we expect in the very near future?"

"Even if the departmental commission accepts the 'series ZS' we developed before the end of this years," replied Nikolay Alekseyevich, "it will be 1987 before we start their output and we will not overcome the lag behind specimens abroad."

Thus, so far, there is little basis for optimism.

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INDUSTRY PLANNING AND ECONOMICS

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PROGRAM FOR 27TH PARTY CONGRESS REVIEWED

Moscow MASHINOSTROITEL in Russian No 1, Jan 86 pp 1-4

[Article by A. Ya. Rybakov, chairman of the Central Committee of the Machine-building and Instrument Making Trade Union, member of CPSU Central Committee, Hero of Socialist Labor: "To New Boundaries"]

[Text] The Soviet country is on the threshold of the 27th party congress. Today this determines the labor rhythm of our life. The party is proceding to its mext forum in close unity with the people with a clear program of action in the area of domestic and foreign policy. Machinebuilders and instrument makers along with the entire Soviet people received with great inspiration and approval the general discussion plans for the new edition of the Program of the party and the basic directions of the economic and social development of the USSR for the 12th Five-Year Plan and the period up to the year 2000.

Almost a quarter of a century has passed since the day the Third Program was adopted. On implementing it, the Soviet people achieved great successes in the development of production forces, the development of economic and social relationships and in expanding socialist democracy.

At the same time, the scientific interpretation of changes in the domestic life of the country and in the world make it possible today to determine more precisely and specifically the prospects of the development of Soviet society and the problems of international politics under modern conditions. All this was reflected in the new edition of the party program.

The plan of basic directions of the economic and social development of the USSR for 1986-1990 and the period up to the year 2000 is a material embodiment of the conclusions of the party program and their translation into the language of specific plan tasks. In the next 15 years, they call for the creation of an economic potential about equal to that accumulated for all previous years of Soviet Power, a doubling of the national income and the volume of industrial production; an increase in the productivity of labor 2.3 to 2.5-fold.

The economics of capital investments with concentration in priority directions will become the decisive source for satisfying the needs of the national economy in additional materials. An increase in the rates and effectiveness of economic development will be achieved by accelerating scientific technological progress, reequipping and modernizing production, intensive utilization of the created production potential, improving the management system, economic mechanism and on that basis achieving a further uplift in the welfare of the Soviet people.

The wide discussion in collectives of machinebuilders and instrument makers of the plans for the new program will facilitate the further development of their creative initiative and activity, a successful start in the 12th Five-Year Plan period and a worthy reception to the 27th party congress.

Machinebuilding will develop in the coming period at leading rates. The production volume in the 12th Five-Year Plan period will be 1.6-fold on the average. A fifth of the output will be renovated every year and the ratio of the highest quality category will be higher by 66 percent in machine tool building, 60 percent in instrument making and 55 percent in light and food industries. High rates of increase in the productivity of labor are also being planned. In machine tool building, for example, rates are planned to be not less than 53 percent, in instrument making -- not less than 70 percent and in machinebuilding for the light and food industries -- 40 percent.

One of the most effective ways to achieve new boundaries is the activation of the human factor, support by each conscientious worker and collective. No one else knows better his true possibilities and the existing bottlenecks, who is not able to put into action his hidden possibilities for the common welfare. And here is the basic area for applying the efforts of trade union organizations. It is specifically here that trade union committees along with economic managers attract widely workers and engineers to the preparation of plans and prospects for developing production. They utilize all social forms of their participation in production management, be it a collective contract, PDPS [Permanent Production Conference] or meetings. Great achievements in this are obvious. An example of this are the victors of collectives in the all-union socialist competition.

For a number of years, the Moscow Production Association for Manufacturing Automatic Lines and Specialized Machine Tools won first class places. At the start of 1985, they completed ahead of time, the plan tasks of the current five-year plan period. Many machine tools and automatic lines of this association compete successfully with similar products of Swedish, West German, Japanese and American firms. They make it possible to save material and human resources.

In the coming five-year plan period, the production volume in the association will increase from 56.6 percent to 58.6 percent of the established control figures without increasing the number of workers; all output will be of the highest category of quality and production costs will be reduced sharply. This approach must be equalized.

Progressive equipment being manufactured which is called upon to provide planned rates of production growth must be utilized properly. Machinebuilders and instrument makers themselves are called upon to show the proper regard for equipment. By 1990, the shift coefficient of equipment, including NC and automatic lines, must be increased to 1.9; flexible production modules and systems -- to 2.5; while at present, it is only 1.57 for the Minstankoprom [Ministry of Machine Tool and Tool Industry], to 1.48 at the Minpribor [Ministry of Instrument Making, Automation Equipment and Control Systems] and to 1.53 at the Minlegpishchemash [Ministry of Machinebuilding for Light and Food Industry and Household Appliances].

Today the certification of work positions is proceeding at full speed at enterprises of our sectors. Outdated and low-output equipment is being replaced by new, efficient equipment. At the same time, the administration and trade union committees are emphasizing improved utilization of the new machine tools and equipment. Especially so since, as a rule, the personnel here is young and energetic. In other words, a new approach and another attitude are needed for the new equipment.

What has been said above applies fully to robot equipment complexes of which more than 20,000 are already in operation in our sectors. The problem is as follows: by 1990, the number of manual workers should not exceed 21 to 22 percent of the total number of workers.

Already today trade union committees and administrations must think seriously about how to utilize freed workers (taking into account age groups and trade skills), so that at their new working places they can apply fully their knowledge and abilities, receive satisfaction from their labor and become active participants in the production process. Only then can an interested approach be expected in discussing plans for the future.

Great interest was shown in plants and production associations at a correspondence meeting on economy, thrift and labor discipline and order in production, organized by the "Trud" newspaper. Workers, engineers, specialists and trade union activists came forward in its pages. Their suggestions on raising efficiency of work indicated that social economic development captures the masses more and more widely and is becoming an all-people movement.

It is not by chance that theCentral Committee of the party considered the problem of workers proposals made at the All-Union Correspondence Conference on the eve of the October Plenum of the CPSU Central Committee, having determined thereby efficient forms for raising the labor activity of workers and mandating all responsible workers to take proposals into account as fully as possible and critical remarks and react to them efficiently.

These same requirements apply equally to managers and trade union committees especially now, during the wide discussion of the plenum documents. Zealous management, a thrifty attitude toward the people's welfare, a sharp and uncompromising fight against wastefulness, unproductive expenditures, naming specific guilty ones for losses and violators of labor and production discipline -- this is what is required today.

The project of the basic directions of the economic and social development of the USSR attests convincingly to the fact that the highest goal of the party's economic strategy remains an undeviating increase in the material and cultural standard of the people. The social policy which spans all facets of human life -- from conditions of work and everyday life, health care and the organization of leisure to social-class and national relationships, these the party considers a powerful means for accelerating the economic development of the country, for uplifting the social-political activity of the masses, and important factors in the stabliity of society, the formation of a new man and the affirmation of the socialist way of life.

Much work is being done in our sectors on implementing the socialist work of the party. Thus, work is practically completed on developing comprehensive plans for improving labor safety and sanitary conditions in 1986-1990. Labor collectives call for the provision of proper labor conditions, the elimination of health hazardous production processes and heavy physical labor, the construction and expansion of a network of medical and sanitation establishments, dining rooms and pioneer camps, and the bringing up to norms of sanitary and personal service facilities.

The vital interests of each Soviet family are reflected in the comprehensive program for developing the production of consumer goods and the area of services in 1986-1990. It became a component part of the basic directions. All of its content is directed to increased production in every possible way, expansion of the assortment and better quality of consumer goods and development of personal services to the people. The program calls for an increase in the consumer goods of not less than 1.3-fold by 1990 as compared to this year.

Special attention is being given to increasing household appliances for most various requirements and, primarily, reducing the time for housekeeping. These are refrigerators, washing and sewing machines and vacuum cleaners. Along with the quantitative increase in their output, emphasis will be placed on increasing the operating possibilities of household appliances, for example, reducing power and material consumption.

The party considers the tasks of the comprehensive program as minimal. Production managers and trade union committees must approach the solution of the posed problem, searching for reserves and additional possibilities on the basis of achievements of scientific technological progress, efficient utilization of capacities, modernization, and reequipment, improved technological processes, using modern kinds of raw and other materials, reduction of material consumption in products, and economical use of resources.

Today a solid base is being created in the machinebuilding and instrument making sectors for manufacturing consumer goods for more than 9.3 billion rubles. The products of the Riga "Straume" Electrical Appliances and Mechanical Devices Plant, the Uglichsk Watch Plant imeni 50-letiya of USSR, Kiev "Yuvelirprom" and "Tochelectropribor" production associations, the Moscow "Mikromashina" Plant and the Vilnyus Grinding Machine Tools Plant are in constant demand.

The accelerated development of consumer goods production must become the constant concern of sectors, managers and trade union organizations. Everyone must be concerned about the people's welfare which is the programed rule of Lenin's party and no effort should be spared in filling it with more extensive and specific content. It is necessary to lean more and more on our own possibilities. Thus, the Kiev machinebuilders, having certified work positions freed 1200 square meters of production area and organized a consumer goods section. Their output is well organized at the following plants: Simferopol "Prodwash," Yartsev Machinebuilding, Tiraspol Casting Machines imeni S. M. Kirov and the Kiev "Elektronmash" Production Association imeni V. I. Lenin.

But so far this has not been done everywhere. For a number of years, there was socialist competition between shops and sections that manufacture consumer goods. About 250,000 rubles are being given annually to the victors. The number of groups getting awards is being expanded very slowly and does not exceed one and a half dozen of subsections. Yet the final goal of the competition is specifically an increase in the number of shops and sections whose work in the expansion of mass demand products would correspond to today's demands. Their ratio is low in the total volume of production in the Gorkiy Machine Tool Building Production Association, at the Berdichev "Komsomolets" Machine Tools Plant, at the Moscow "Tizpribor," the Vologodsk "Myasmolmash" and other plants.

The production of consumer goods is disregarded by the Ivanovsk, Tula, Zakarpatsk, Yaroslav, Ryazan, Kabardina-Balkarsk and a number of other oblast committees. Instead of taking an active position in this matter and participating directly, they have limited themselves to the role of outside observers.

As a result, collectives of exactly these regions are absent among winners of socialist competition and consequently the work of the shops and sections for manufacturing consumer goods is not sufficiently effective.

The Dnepropetrovsk obkom of the trade union is an example of work initiative. A system of measures was developed there for the expansion of the output of consumer goods on the basis of fuller utilization of the enterprise possibilities; socialist competition of collectives was organized, and positive experience is being generalized and expanded. This made it possible for the enterprises in the oblast to manufacture 107,500 rubles worth of goods in the first half of 1985 alone. There are also things to learn from the Khmelnitsk and Smolensk obkom committees of the trade union.

The realization of the party program tasks is impossible without a radical improvement in the quality and assortment of products, and an increase in their technical and esthetic standards and reliability in operation.

About 1000 new kinds of consumer goods are assimilated in production and about the same number of unmarketable products are removed from production. The ratio of the highest category of quality goods increases constantly. It is expected that by the end of the current year, it will be 37 percent in the Minlegpishchemash, 42.9 percent at the Minpribor and 17.2 percent at the

Minstankoprom. As a whole, a stable trend has begun to show in the reduction in complaints, guaranteed repairs and scrap losses.

One of the criteria of the quality of goods is, as a rule, consumer demand. Therefore, work on the quality of goods must be constantly at the center of attention of trade union committees and production managers. It is necessary that our products and their technical standards compete successfully with similar foreign goods in metal and power consumption which will satisfy the demands of theSoviet consumer to a greater extent. The Scientific and Technological Society and the All-Union Society of Inventors are still isolated from this work, although by their purpose, they are called upon to activate in every possible way the creative activity of innovators, increase their yield considerably and be pioneers in developing new technical solutions.

In the coming five-year plan period, the comprehensive programs call for a considerable increase in the role of services in improving the living conditions of the Soviet people, their spiritual and physical development, and more rational utilization of their free time. Along with the further development of payments and privileges from the social consumer fund, it is planned to create a branched system of paid services. In machinebuilding sectors this is for the satisfaction of the considerablly increasing demands, in recent years, of workers for construction and repair of housing, buildings of orchard-growing societies, garages and parking places for personal transportation facilities, improvement of public dining and personal service facilities directly in production, and the expansion of the possibilities for rest and relaxation.

The development of these directions will be done by the joint decrees of sector ministries and the Central Committee of the Trade Union. Thus, in associations, enterprises and organizations of the Minstankoprom by 1990, 36 facilities for servicing workers, will be built. These will include barbershops, laundries, booths for selling airline and railroad tickets, posts for receiving clothes for sewing and mending, repairing household appliances, and stores for selling semifinished products. By 1990, the volume of paid services by the enterprises of the Minpribor will increase to almost 10 million rubles and by the Minlegpishchemash -- to 18 million rubles. Much has already been done in this direction and will be done in the future. The Lvov "Mikropribor" Production Association imeni 60-letiya of Soviet Ukraine can serve as an example. The association has already today two rest bases, a health center with 70 beds, two preschool combines, one of which is of the sanatorium-health resort type, a beehive, a medical center for 450 visits per shift, a barbershop, a "culinary" store, an "order counter" and two cafeterias. Mechanized food lines for servicing food in dining rooms fully satisfy the requirements of workers. Successes are being achieved also at the Riga machinebuilders, at the "Straume" and the "Kompressor" Refrigerator Plants, the Kolomna Machine Tool Building Production Association and the Kalinin "Tsentrosvar" Welded Structures Plant.

The organic component part of the project of the basic directions of the economic and social development of the USSR for 1986 to 1990 and for the period up to 2000 are the state plan and the budget of the country for the

first year of the 12th Five-Year Plan period, approved by the Fourth Session of the USSR Supreme Soviet of the 11th Convocation. The distinctive feature of the plan is increasing the development rate of the national economy. The national income used for consumption and saving will increase by 3.8 percent in 1986 as compared to 3.2 percent the average annual increase for the 11th Five-Year Plan period. Industrial output will increase by 4.3 percent as compared to 3.7 percent respectively. The productivity of social labor will increase by 3.8 percent and in industry -- by 4.1 percent.

The volume of output in the key industry, machinebuilding, will increase in the first year of the new five-year plan period by 6.6 percent. The output of flexible production modules and automatic systems, industrial robots and other modern equipment will increase. Large problems are to be solved by machinebuilding in the Power and Provision programs, and in the Comprehensive Program for developing the production of consumer goods and in the area of servicing.

Discussing the projects for the new edition of the party programs and basic directions for economic and social development of the country, machinebuilders and instrument makers are analyzing extensively what has already been achieved and are striving to make a still greater contribution to the acceleration of scientific technological progress and are doing everything possible to increase the efficiency of production, and meet the coming 27th party congress with new labor successes.

2291
CSO: 1823/139

INDUSTRY PLANNING AND ECONOMICS

UDC 621.65.011.56:338.984

AUTOMATION OF TECHNICAL AND ECONOMIC PLANNING

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 11, Nov 85, pp 28-30

[Article by G.G. Globa, engineer]

[Abstract] The concept of the level in automated management systems allows organization of the computational process to eliminate loops and repeated operations in calculating operational indices. The PPP MODEL PLAN economic-mathematical model encompasses calculation of the major technical and economic indices in various segments of a current operating plan; the plan of production and actualization of production; the plan for labor and wages; the plan for supply of materials and equipment; the cost, income and profit plan; the plan for economic stimulus funding; and the financial plan. The use of the PPP MODEL PLAN with modern computer equipment and communications networks significantly improves the effectiveness of economic services workers at tool enterprises, facilitating the introduction of new equipment and methods of solving planning problems involving active automated information support of the plan development process. The use of computers as an active partner for economic services workers performing planning tasks can best distribute functions between them. The workers can use an extensive article of informal factors in accordance with their practical experience and intuition, and the computer system alloys real-time processing of large volumes of information.

6508/12640
CSO: 1823/73

INDUSTRY PLANNING AND ECONOMICS

UDC Δ65.011.56:338.984.3

AUTOMATION OF PLAN COMPUTATIONS FOR CAPITAL INVESTMENTS IN BRANCHES OF INDUSTRY

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTIVA in Russian No 11, Nov 85, pp 35-38

[Article by V.I. Zaytsev, candidate of economic sciences]

[Abstract] A standardized logic can be applied to the development of a plan for capital investments in a branch of industry, including analysis of the fulfillment of the plan for capital investments, determination of the scale, composition and structure of the problems in consctruction; determination of the requirements of society for the products of the branch of industry; determination of requirements of the branch of industry for materials, equipment and other resources; clarification of the volume of production facilities necessary to output the product of the branch of industry in sufficient quantity to satisfy the demand of the population; determination of the limits of capital investments and their structure necessary for creation of new production facilities; development of the limits of capital investment based on financial and material resource considerations; and optimization of the distribution of capital investments among organizations for reconstruction of existing and creation of new facilities. The PIR (Planning Research Work) segment of the branch control system is used to calculate costs of planning and planning research work, to define the basic technical and economic parameters of construction projects and monitor the availability of planning documentation for construction work to be done during a year. The various elements of the capital construction segment of the branch automated management subsystem are described in brief.

6508/12640
CSO: 1823/73

PREPARING FOR RECONSTRUCTION OF A PLANT

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 12, Dec 85 pp 79-88

[Article by N. Yermokhin, chief engineer, "Agregat" Experimental Plant, Moscow, B. Kovalev, branch laboratory chief, candidate of technical sciences, V. Kozlov, and P. Kulik, branch laboratory chief, doctor of technical sciences]

[Abstract] "Agregat" Experimental Manufacturing Plant in Moscow produces DC electrical machines in short production runs by largely manual manufacturing methods. A group was set up to study and plan complete automation of the production processes at this plant. Theoretical and experimental work was performed in 1982-1983. Beginning in 1983, pilot-scale automated operation was begun using a flexible armature-winding module. All new modules were coordinated by a mini- and microcomputer-based control system planned for introduction in late 1985. New administrative approaches have also been developed to allow rapid and effective introduction of scientific developments to production. It is hoped that this plant can serve as a test case for development of similar automated facilities in other areas, so that special research institute-based working groups of this type need not be set up wherever a factory needs reconstruction.

6508/12859
CSO: 1823/102

INDUSTRY PLANNING AND ECONOMICS

INDEPENDENT FINANCING OF THE SUMY MACHINE BUILDING SCIENTIFIC-PRODUCTION ASSOCIATION IMENI M.V. FRUNZE

Moscow EKONOMICHESKAYA GAZETA in Russian No 45, Nov 85 p 6

[Article by V. Denisov, Sumy]

[Abstract] Since the beginning of 1985, the Sumy Machine Building Scientific-Production Association has been fully independently financed except for individual areas related to financing of capital investments, distribution and utilization of profit and amortization costs, formation and utilization of economic stimulus funds and the unified fund for development of science and technology. This article describes the essence of the new operations, in that progressive standards are used for deductions from income, the sequence of formation of economic stimulus funds has been changed to make them independent of costs and the specific share of products with the state mark of quality. On an experimental basis these funds are formed based on stable standards from income, which depends primarily on reduction of cost and increasing quality of products. In the first ten months of 1985, the association fulfilled its obligations for delivery of products 100 percent, the productivity of labor increasing by 14.4 percent, output by 13.9 precent in comparison to the previous year, profitability increasing by 25.5 percent, much greater than the average for the industry. Tables 2.

6508/12640
CSO: 1823/66

INDUSTRY PLANNING AND ECONOMICS

PLANTS ON LEADING EDGE OF TECHNICAL PROGRESS

Moscow EKONOMICHESKAYA GAZETA in Russian No 47, Nov 85, p 8

[Article by Ye. A. Matsegora, General Director, Novokramatorskiy Machine Building Plant]

[Abstract] The process of modernizing metallurgical plants is continuing, with 11 rolling mills presently being modernized at the Novokramatorskiy Machine Building Plant to achieve automatic regulation of the thickness of rolled strips. Over one third of the increase in production at the plant during the twelfth 5-year plan is to be achieved by modernization of equipment and reconstruction of facilities, with 187 million rubles committed to this purpose at the plant. A completely mechanized sector for the manufacture of forgings from ingots using an automated press is planned. Fifty-six numerically controlled machine tools, 65 special and combined machines, including processing centers and three flexible automated production facilities will be introduced. Computers are widely used in planning of production here. The new economic conditions have forced improvement of planning, accounting and monitoring of the filling of orders, all helped by computers. Automated planning systems are widely used in the welding and metallurgical shops, and automated planning of design work is being introduced. By 1990, one-fourth of all design development will be automated. A study is being made of criteria for additional pay for specialists capable of using computer equipment who take active part in the creation and improvement of automated planning systems. The plant is currently involved in the manufacture of a 10,000 ton hydraulic press for the Zhdanov heavy machine building plant, and a unique 45,000 press for the Kramatorsk "Energomashspetstal" plant. The quality of these and other products depends largely on the quality of components, but the plant has little ability to influence the quality of products made by its suppliers.

6508/12951
CSO: 1823/97

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 061.4.001.18

NEW MACHINE TOOLS SHOWN AT EXHIBITION

Moscow MASHINOSTROITEL in Russian No 10, Oct 85 pp 5-8

[Article by O. B. Yuryev: "The Largest Exhibition of Scientific-Technical Achievements"]

[Text] At the April (1985) CPSU Central Committee Plenum it was noted that the party is making the thorough acceleration of scientific-technical progress the main strategic lever in the intensification of the national economy and the better use of accumulated potential. The need for revolutionary advances was also noted -- the transition to fundamentally new manufacturing systems and state of the art equipment with the highest efficiency, the reequipment of all sectors in the national economy on the basis of contemporary scientific and technical achievements. A visitor to "Scientific-Technical Progress 85", an exhibit held this year at the VDNKh SSR [Exhibition of the Achievements of the National Economy of the USSR], could vividly see how these urgent tasks are now being solved and get an idea of the prospects for developing domestic science and technology in the immediate future. The more than 3,000 exhibitors in its 18 sections made it possible to make a unique and interesting tour in the world of scientific-technical achievements for all sectors.

Machinery building occupied a leading role at the exhibition. The introduction of flexible systems in this sector makes it possible to increase labor productivity 5-6 fold, shorten the production cycle 7 fold and improve the use and shift coefficients 2.5-3 fold.

At the exhibition there was a flexible automated section (GAU) intended for machining various parts in batch production. The assortment of parts machined on this system ranges from 3 to 1,000. It includes a GPM [not further identified, possibly: Flexible production machine] based on a STP- 220 PR machine tool and a RM-104 robot for turning 16-20 mm diameter parts weighing up to 5 kg; a GPM based upon a 1720PF30 machine tool and a M20P40.01 robot for turning parts up to 400 mm in diameter and up to 20 kg; a GPM based upon a MTs-1 250 KD machining center for machining 150x150x150 mm boxlike parts (the number of GPM in a section is determined by the production program.) In addition, the section is equipped with an automated storage unit for storing a large number of items and a crane-stacker, having three control regimes: manual, semi-automatic and automatic through a computer in an ASU [Automated management system]; a Rotor-1 transport robot for transporting, reloading and

positioning standardized pallets holding tools, fittings, blanks and finished parts, an automated work station for the dispatcher for interactive receiving, transmission, collection and storage of current information obtained from computers at various levels and on the work of manufacturing equipment in the flexible automated section, on the management of the transport-storage system, the transmission of control programs and information on meeting shift targets; a section for the engineering preparations for production ASTPP GPS for manufacturing process charts for preparing programs for numerically controlled equipment.

The GAU automates up to 85 percent of the production process, shortens the manufacturing cycle 4-6 fold, increases equipment shift coefficients up to 2.5 fold, labor productivity 2.5-4 fold and reduces the production area 2-3 fold.

The section "Comprehensive Mechanization and Automation of Production Processes in Machinery Building" included the LLT-10 automatic rotary-conveyor line for making up to 200 thermoplastic parts. This line is patented in a number of capitalist countries. Compared to the better foreign and domestic models it increases labor productivity 4-6 fold, reduces the unit consumption of electrical energy by 1.5-2 fold, and, through an 8-12 fold reduction in labor intensiveness, frees 12-20 workers. The economic effect from the line's introduction amounts to 200,000 - 300,000 rubles.

The SA-1100M multipurpose assembly automat was developed and exhibited by the Motor Vehicle Plant imeni I. A. Likhachev. This automat, the design of which resulted in 6 author's certificates, is intended for the simultaneous assembly of parts, from simple ones to components made up of 8-10 parts with different configuration.

Assembly is performed by orientation-assembly attachments which are vibrated by air jet generators. These latter are installed on a 18 position programmed rotating table with air jets for rotating the surface plate. The vibrations assure the automatic search and mutual orientation of the parts to be assembled, which are fed to an orientation-assembly attachment from the pneumatically controlled vibration bunkers and magazine devices.

The rotating table has a special, easily readjustable program device determining the table's work cycle and each position of the automat. Depending upon the assembly sequence, when the table is at the correct position, the device turns on the feed and actuators. The vibrating bunker is equipped with quick change cups, making it possible to quickly reset the automat to assemble a new part.

The automat sequentially assembles various components and sequential-parallel assembles equivalent components. The table's rotation spacing is increased in proportion to the number of parallel assembled parts. The drive for the table and vibratory orientation-assembly attachments has no rigid connections, eliminating the possibility of breakdowns if an unsuitable part enters the machine or if there are other disturbances in the assembly process. It also assures complete safety for set up workers and operators.

Depending upon the type of assembly, the automat's productivity is 720-2,800 parts per hour. Part size can be up to 1,800x1500x1200 mm, and weight up to 300 kg. The annual economic effect from the automat's introduction is 10,000 rubles.

The ATI-4 pipe welding automat for welding pipes by a pulse arc in an inert gas was another exhibit.

This automat is a light, easily transportable non-frame head type which is attached to the pipe to be welded by a double roller-bushing chain. Several components are attached to the head: a burner, oscillating welding wire feed, stretcher, cassetes, current converter and switch block. The components for the electrode vibrator and wire feed have the same electric drive. Wire feed speed is synchronized with the the impulse capacity of the welding arc. The automat is controlled by a switch located directly on the head housing. This eliminates the need for a portable panel and an apparatus case and simplifies the operator's work in welding in all spatial positions. The mechanism for vibrating the electrode makes it possible to change the direction of vibration relative to the layout and the amplitude of the vibration and the angle of the electrode relative to the surface being welded during the operation. Pipe is welded in two semi-rotations from the bottom up, with continuously adjustable process speed.

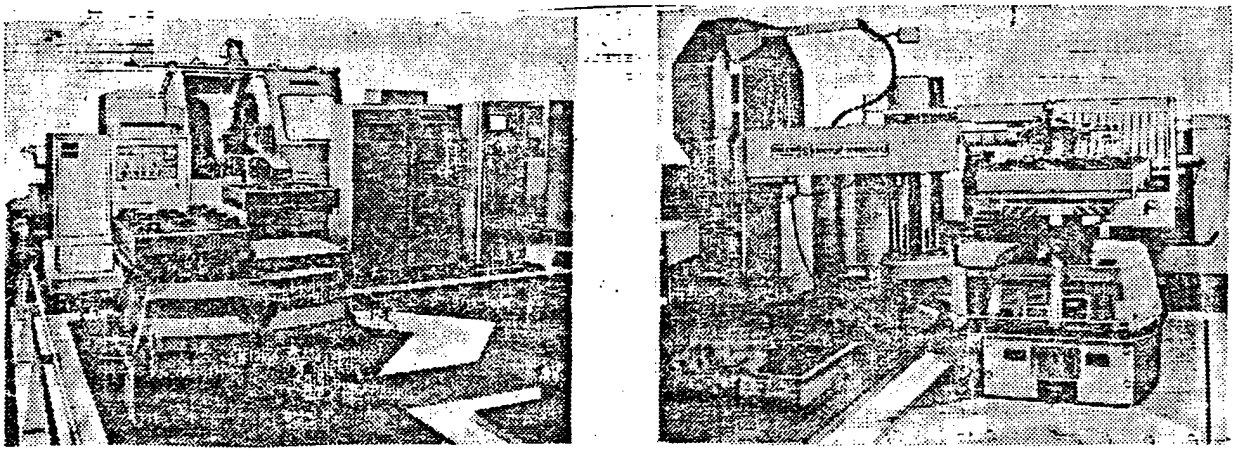
The automat uses a new small welding torch (a.s. 889333). The new variable component for wire feed makes it possible to change the feed speed during welding.

During gas-electric welding of pipes, the inert gas cloud can assume various shapes, creating difficulties in assuring reliability of protection. In order to save the inert gas and to assure continuous variation in the speed of gas flow, a gas regulator, (a. s. 946847) has been installed on the housing and moves along the pipe with it.

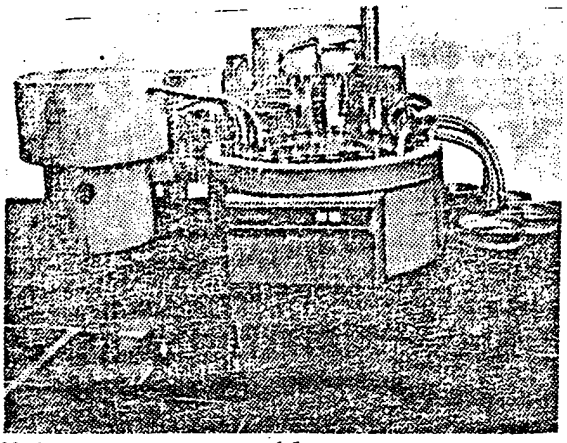
The economic effect from the introduction of the ATI-4 is 10,000-20,000 rubles, depending upon pipe diameter and thickness.

An automated complex for non-layout stamping of parts from sheet metal considerably improves labor productivity. It was developed at the Rostov NIITM [Scientific Research Institute for the Technology of Machinery Building] and consists of a bed, a movable slide with grabs, a screw driving mechanism, stripper, a table for sheet stops, a traverse with suction devices and a jib crane. The standardization of the slide and the drive screws makes it possible to cut parts of differing configuration and sizes from 4 mm thick sheet metal without preliminary layout on strips (4 alternatives for layout with a 200 mm maximum blank diameter.) Productivity is 1,400 pieces per hour. If necessary it can be equipped with a special transporter for collecting parts or wastes.

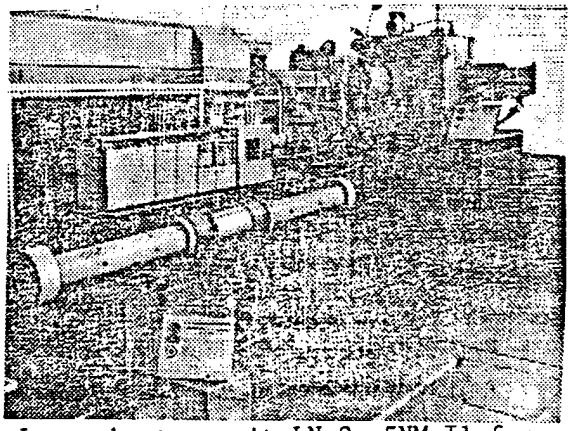
The introduction of the complex at 4 agricultural machinery building plants saved 200 tons of metal annually.



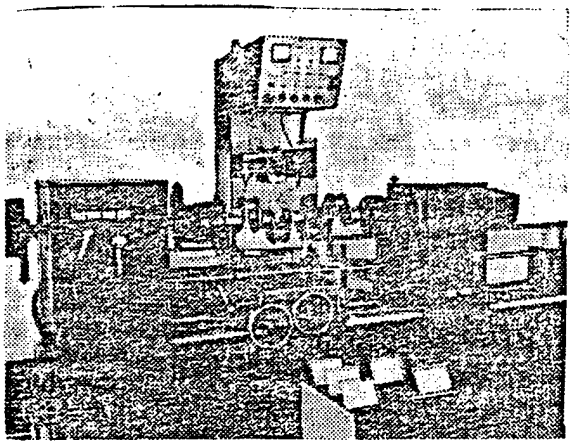
Flexible manufacturing sections for machining parts in batch production, built by the Krasniy Proletariy Machine To 1 Building Production Association



Multipurpose assembly automat model SA-1100M built by Motor Vehicle Plant imeni Likhachev, Moscow



Laser heater unit LN-2: 5NM-11 for heat treating, alloying, plating, surfacing and welding (front view). Bulat-20 unit for vacuum coating (rear view).



011-1-00 unit, developed by Remdetal VNPO, repairs cylindrical parts by the electric arc surfacing method.

An air jet tracking system for active control and management, intended for controlling the machining cycle at automatic grinders was developed by the PO GPZ-1 [Production Association State Bearing Plant-1] and the Simferopol NPO Pnevmatika. The system assures work safety and improved labor productivity through reductions in auxiliary time for switching drives for the workpiece to working feed. It has minimal clearance between the workpiece and grinding wheel. It is built from jet elements with the following reliability indicators: operation prior to breakdown is $1x10^6$ and the average service life is 12.5 years.

The air jet tracking system is protected by several author's certificates and is reliable and simple to operate.

Several problems are created by flashes on stamping when dies wear during sheet metal stamping. The elimination of flashes means improvement in product quality and sharply increases stamping efficiency through reductions in the readjustment of dies because of wear on the cutting surfaces. Traditional stamping methods, eliminating flashes, or with subsequent finishing (galtovka [trans. unknown], grinding, etc) are complicated and require additional costs. Scientists from the Kishnev Polytechnic Institute imeni S. Lazo and specialists from the Elektromashina Plant in that city were able to solve this problem. They developed a number of methods and dies eliminating flashes during die dulling.

These basically new methods involve controlling the metal separation process the creation of tensile forces in the cutting zone which deflect the trajectory of fissures towards the flashes. This tension is created by elastic elements attached to the die face. Changes in the structure of the separation mechanism during cut-off by the edge of the spacing cutter [shagoviy nozh] improved its durability thanks to the redistribution of the cut metal of its upsetting (a. s. 944712). The effect of the counteracting knives upon the rolled metal prevents the formation of flashes on the part face.

High productivity with comparatively simple dies, the production of high quality parts and reductions in the number of stamp readjustments assure a considerable economic effect.

Improvements in metal cutting tool life are very important for contemporary production. VNIIETO [not further identified] has developed the NNV-6.6-I1 for applying a wear resistant coating to a wide range of cutting tools (up to 200 mm in diameter and 250 mm long). It consists of three components: a working chamber mounted on a stand with a vacuum system, a feed source and a control panel. The blocks are connected by quick-break lines. The installation uses a feed source with continuously variable voltage and a planetary mechanism for rotating the workpiece. Also, it has improved, reliable systems for controlling and managing the process.

Specifications

Size of working chamber	600x600
Number of electric arc evaporators	3
Speed of coat deposition, microns/hour	13...40

Specifications [continued]

Pressure in chamber, Pa	$6.65 \times 10^{-3} \ldots 6.65 \times 10^{-1}$
Gas consumption, nl/h	0...30
Cooling water consumption, m^3/h	2
Dimensions,mm	3,900x3,150x2,070
Weight of unit and accessories, kg	3,400

The unit is highly productive and the costs for its installation and startup are not great.

Another direction in improving the accuracy and quality of machining parts from hardened steels, pig iron and other hard to machine materials is the creation of tools with polycrystalline superhard materials based upon cubic boron nitride of the type "belbor" and elbor-RM". However, the fixing of polycrystalline superhard materials to the tool holder is still a difficult problem in tool production

The Institute for Solid State Physics and Semiconductors, Belorussian SSR Academy of Sciences offered visitors an exhibit of bi-inserts [biplastin] with a cutting layer made from the superhard material "belbor" on a superhard substrate, which can be brazed on to the tool holder without loss of physico-mechnical or cutting properties. In addition, the institute has developed a method for synthesizing bi-inserts and a technology for producing round inserts up to 6 mm in diameter and 3 mm thick. The cutting properties of these inserts are at the level of the better grades of belbor type polycrystals

The high physico-mechanical properties of the inserts make it possible to use them in various metal cutting tools for cutting parts made from pig iron, hardened steel with hardness of HRc 40...66 and other hard to machine metals. Tools equipped with bi-inserts assure high precision (1-3rd class) and low roughness (1.25...0.61 microns) One good feature of the inserts is that they can be easily and reliably brazed on to a tool holder by ordinary methods. They can also be successfully used as cutting elements for various metal cutting and boring tools, circular saws for cutting wood chipboard, etc. The strong bond of the inserts to the holder permits finishing, semifinishing and precision machining of parts at cutting depths of up to 0.5-1 mm.

Universal epoxide glue occupied a modest place at the exhibit, but how valuable it is, like gold! The qualitative indicators of the glue are at the level of the better Soviet and foreign types. It is intended for gluing metals, plastic, wood, ceramics, glass, hard resins, hides and any other material to itself or to anything else (with the exception of teflon and polyethylene. It can be used for facing and sealing cracks and can be used to make various small objects by pouring it into forms and hardening it at room temperatures. The hardened glue can be shaped and painted.

One advantage of the glue is the lack of volatile components, making it possible for it to harden in cold weather or when heated. Simple contact is sufficient for gluing objects together. At 36 degrees C it takes at least 24

hours for the glue to harden. The strength of the bond on steel is over 100 kg per square centimeter.

The mechanization and automation of production is unthinkable without the extensive use of computers. This is why computers and microprocessors occupied one of the places of honor at the exhibition. It seemed as if children who came to the exhibition with their parents were just playing when they sat down at school computers and drew graphics on the screen displays. In fact, they were learning the ABC's of complex computer technology. In a few years they will be sitting at the panels of complicated control computers, without which it is impossible to imagine contemporary production.

Mass consumption goods had a special place at the exhibition. Some of them are produced by machinery building enterprises. These include modern refrigerators, camper trailers, bicycles, motor cycles, devices for the automatic preparation of potato dishes, toys, etc.

The exhibition "Scientific-Technical Progress 85" not only vividly demonstrated the achievements of our national economy, but also posed the task of eliminating shortcomings and lagging in various directions and outlined paths for the further development of domestic science and technology. In moving forward to the 27th CPSU Congress, the Soviet people are now laying the basis for new successes in the acceleration of scientific-technical progress. The exhibition "Scientific-Technical Progress 85" was convincing evidence of this.

11574
CSO: 1823/80

METAL CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 621.9.06-114-529.002.237

NEW MACHINE TOOLS FROM IVANOVO PRODUCTION ASSOCIATION DESCRIBED

Moscow MASHINOSTROITEL in Russian No 10, Oct 85 pp 42-43

[Article by I. S. Vitol: "To Produce High Quality Machine Tools"]

[Text] The Machine Tool Building PO [Production Association] imeni 50 Years of the USSR in Ivanovo is a modern highly mechanized complex enterprise specializing in the production of multi-operation machine tools (heavy duty horizontal boring machines, numerically controlled machine tools), highly efficient cutting tools and accessories. The machine tools built by this association are widely known in our country and abroad as being highly productive and reliable. The State Quality Mark has been awarded to 73.4 percent of its products. All machining centers have been certified for the highest quality category. For achieving high and stable indicators in All-Union socialist competition and in completing the state plan for the economic and social development of the USSR and increased socialist obligations for 1983 the association's collective was awarded the Challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee and was put on the All-Union Honor Board at the VDNKh USSR.

The association demonstrated its achievements at the Machinery Building Pavilion of the VDNKh SSSR. This article describes some high precision machine tools.

The IR320PMF4 multipurpose machine tool has a 4 and 12 place pallet shuttle and is intended for highly productive and precise machining of especially complex boxlike steel and light alloy parts up to 250x250x250 mm in size. This machine tool has a combined NC [numerical control] system, automatic tool and work piece change, a spindle which can be moved vertically and horizontally and a transversly mobile, horizontally rotating table. On the upper face of the tool is a circular [koronochiy] type tool holder for 36 tools. In one setting a part can be drilled, core drilled, reamed and bored to exact coordinates, linearly or curvilinearly contour milled, threaded, slotted and helixes can be cut on it.

The rotary table makes possible circular milling and highly precise circular profiles on cylindrical surfaces. The wide range of rpm's and feed rates makes possible the highly productive machining of a broad assortment of materials

(from light alloys to high strength alloys, and tough, high temperature steels). A hydromechanical device guarantees reliable and rapid attachment of the tool to the spindle. The cutting zone is cooled with cutting fluid [SOZh] and chips are collected automatically. The annual economic effect from the machine tool's introduction is 72,400 rubles.

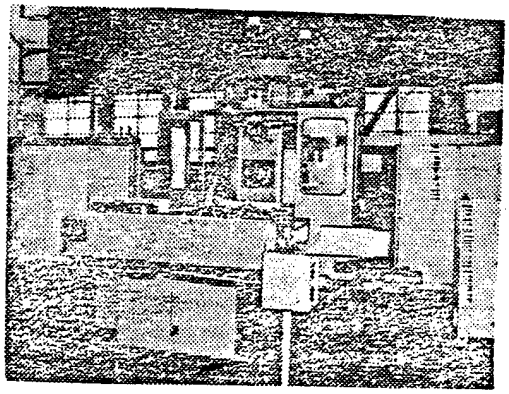


Figure 1. IR800PMF4 Machining Center

The IR500PMF4 machining center is a multipurpose horizontal spindle NC machine tool intended for the highly productive machining of boxlike parts made from various materials (from light alloys to high strength steels). It is mounted on a rigid T-shaped base. The machine tool is equipped with an 8 pallet automatic work changer and a two place storage unit. The tool holder (for 30 tools) is mounted on the upper part of the machine tool outside the working zone. Tools are changed automatically, by program. Tools are cooled by cutting fluid. On special order, the processing center is equipped with an automatic device for collecting chips.

The cutting zone is surrounded by a reliable barrier to protect the operator and the environment from emulsion spattering and flying chips.

Parts are machines on the rotary table by movement of the tool column, spindle and the table itself. The precisely installed rotary table has expanded the manufacturing potentials of the machine tool and made it possible to machine coaxially aligned openings with free standing spindle [konsolnyy] tools, with the table rotating 180 degrees. Hydromechanical pressure (12.5 kN) on the tool in the spindle guarantees reliable and rapid attachment of the tool. The spindle has NC automatic orientation.

The annual economic effect from the introduction of the machining center is 88,000 rubles.

The IRT180PMF4 automatic turning center with a contour-position NC and an automatic work changer is intended for the comprehensive, highly productive machining of rotating ferrous and nonferrous metals parts where there are few people present.

This center can be used for turning and cutting threads, drilling indexed holes in the external and facial surfaces of parts, for cutting flat surfaces and slots in complex shaped parts and for cutting non-coaxial threads. It is equipped with an automatic tool change device (for 24 tools), sensors for the the monitoring of set up, breakdown and wear and for the dimensions of the parts being machined.

Its high degree of automation makes it possible to use this machine tool either autonomously or within a flexible manufacturing system. The basic components, the headstock and the turret slide are mounted on a common rigid base. A hermetically sealed working zone makes possible machining with an abundant cutting fluid flow (up to 100 liters per minute). Chips are removed from the cutting zone by a scraper type transporter.

The time factor has a huge role in the creation of competitive equipment. Machine tool production should be mobile, that is, capable of readjusting to the development and manufacture of new equipment in accordance with the demands of scientific and technical progress. The introduction of the comprehensive-combined method of NC machine tool design, the technical reequiping of the plant, technology restructuring, production organization and the creation of a new system of relations with customer plants have all helped reduce the cycle for creating new equipment. The production (from beginning of design to output) of the first machining center required a year, while previously the creation of less complicated equipment took 4-5 fold more time.

The Talka-500 flexible manufacturing system makes possible the automatic, computer controlled batch production of boxlike parts (from blank to finished part). It increases labor productivity 1.73 fold and reduces the number of service personnel and the use of machine time to 76 percent. The annual economic effect is 709,700 rubles.

The IR200AMF4 multitool NC horizontal spindle machine tool with automatic tool change (24 tools) and pallet shuttles is intended for the precise and highly productive machining of super complex small boxlike parts made from a variety of metals (from light alloys to high-tensile steels). This machine tool is used as part of a flexible manufacturing system.

The wide range of speeds and feeds makes it possible to drill, core drill, ream, and bore, cut flat surfaces and contours with linear and round interpolation, and to cut threads. The automatic control of the spindle assures high precision of the part by a measuring probe.

A rotary tool holder holds a complete set of cutting, measuring and auxiliary tools appropriate for machining boxlike parts. Holders are widely used on NC machine tools, universal metal cutting machine tools and at shop tool rooms for equipping and storing tools. A drum with sockets for tools and a pallet for accessories and measurements probes is mounted on bearings, making possible its smooth and easy 300 degree rotation. The use of tool holders increases labor productivity without capital outlays and makes it possible to rationally organize the operator's work place.

The System-500 set of tools and accessories are used for installing and attaching boxlike parts for machining on the IR500MF4 and IR800MF4 multi-purpose machine tools for batch and job-lot production. The parts must be installed and attached on various size vee-blocks both on and off the machine tool.

The presence of a system of index holes and locking elements assures the strict basing of parts relative to the origin of the coordinates. The set is intended for machining a wide range of blanks by readjusting, changing or regulating the installation or clamp components.

The IR800PMF4 machining center is a multi-tool horizontal spindle NC machine tool with automatic tool change and pallet shuttles. It is intended for the comprehensive, highly productive machining of boxlike parts made from various metals (from light alloys to high-tensile steels) and can operate in a computer controlled flexible manufacturing system.

A comprehensively mechanized line for manufacturing large mold cores from cold hardening and liquid viscous self-hardening mixtures based on synthetic resins consists of an LU-1,000 installation with a drive line for feeding coreboxes and a drier for surface drying the walls. The annual economic effect is 157,000 rubles per ton of casting.

The technology for manufacturing large and medium sized casting forms in caisson and welded jackets by casting liquid, self-hardening mixtures and assembly under a covered core makes it possible to reduce manual labor, free production area and improve casting quality. The annual economic effect is 96,000 rubles.

A comprehensively mechanized section for finishing castings by the air-arc shaving method and shot cleaning increases labor productivity 5 fold, reduces manual labor and improves production standards. The annual economic effect is 250,000 rubles.

11574
CSO: 1823/80

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 621.9.06-529.002.72

MAIN WAYS TO IMPROVE LAYOUT OF MULTIPURPOSE MACHINE TOOLS WITH RESPECT TO RIGIDITY

Moscow STANKI I INSTRUMENT in Russian No 1, Jan 86 pp 5-7

[Article by V.N. Yevstigneyev and Z.M. Levina]

[Abstract] An important criterion for layout of modern machine tools with numeric program control, particularly multipurpose machine tools, is rigidity of their support structure. The four major ways to improve their layout from this standpoint are: 1) rational balancing of the compliance characteristics of support structure components; 2) correct shaping and dimensioning of stationary members and movable jigs for stiffness; 3) comparative analysis of possible design variants based on competitiveness of machine components and operating modes, typically such important components as jigs, chucks for horizontal spindles, pedestals, and table with slide in cross movement; and 4) comprehensive and precise theoretical stiffness calculations. Depending on the particular problem in specific cases, any one way alone or several ways and even all ways combined will lead to a better layout. Figures 4; references 4: all Russian.

2415/9365
CSO: 1823/124

METAL-CUTTING AND METAL-FORMING MACHINE TOOLS

UDC 621.9.06-114-529-229(064)

TOOLING FOR NC MACHINE TOOLS REVIEWED*

Moscow MASHINOSTROITEL in Russian No 1, Jan 86 pp 44-45

[Article by Yu. I. Kuznetsov, candidate of technical sciences]

[Text] The anniversary exhibitions at the USSR VDNKh "Hungary -- 30 years on the socialist road," "Yugoslavia -- today," "Czechoslovakia -- 1985" demonstrated progressive tooling for NC machine tools: fixtures, cutting and auxiliary tools, devices for changing tools and pallets automatically.

The Chepelsk Machine Tool Building Plant (Hungary) manufactures precision machining centers. The model MK-500 machining center with a horizontal spindle is equipped with two interchangeable disk tool magazines with a capacity of 24 tools each (maximum weight of tool is 15 kg). The tools are changed by the vertical movement of the spindle workhead, the horizontal movement of the spindle and the rotation of the magazine. The device for changing tools automatically eliminates the need for an automatic loading device, simplifies the design and increases the reliability and precision of the work. The machine tool is also equipped with a device for changing pallets automatically (the pallet size is 500x500 mm). A two-position auxiliary table with an automatic loading device is installed in front of the machine tool.

While the machine tool is in operation, the intermediate product is changed on the pallet. When machining is completed, the pallet with the machined intermediate product is moved automatically to a free position on the auxiliary table after which the machine tool table is moved to the second position of the auxiliary table to receive the pallet with the new intermediate product. The automatic change of the pallet takes 25 seconds. The machine tool is equipped with a Forcon Modul modular tool system.

The model YBM-90N machining center with a horizontal spindle is equipped with a chain magazine which has a 40-tool capacity (60 and 80 tool magazines are supplied on order), installed on the lateral side of the column of the machine tool and a two-grip automatic loading device which transports the tool from the

*According to published materials abroad

magazine to the spindle of the machine tool. The maximum weight of the tool is 20 kg.The time of its change is 6 seconds. It takes 15 seconds between the manufacturing steps (from chips to chips). The locating and clamping components of the fixtures are mounted directly on the pallets on which a grid of coordinate fixing and threaded holes is made. The machine tool is equipped with a device for automatically changing pallets and consists of a two-position rotary table installed in front of the machine tool. Changing the pallet automatically takes 50 seconds.

The model YBM-90N-80 machine tool has 800x800 mm pallets, the YBM -90N-100 -- 1000x1000 mm pallets and the TBM-90N-125 has 1250x1250 mm pallets. The YBM-90N-100/6 machine tools are equipped with oval magazines (with a capacity of six pallets) for operating in the third shift with unmanned technology. The plant also manufactures the SD-NC-610 flexible production module which consists of two NC lathes, an industrial robot and a storage magazine for intermediate products and parts.

For large series production, the "SZIM" Machine Tool Building Combine (Hungary) manufactures the model MC403 three-spindle machining center with horizontal spindles.The machine tools can machine three intermediate products simultaneously. Machine tool 2 (Fig. 1) is equipped with two independent unit heads, device 1 to change tools automatically and device 3 to change pallets automatically. The device for the simultaneous automatic change of three tools consists of a horizontal drum 12-position cassette magazine in which two various sets of tools are stored. When changing three tools automatically simultaneously, the three previous tools are placed in the three free places of the cassette, while three new tools are placed in the machine tools spindles. The maximum diameter of the tool is 125 mm, length is 290 mm and the weight is 7 kg. The change time is 30 seconds. The device for changing pallets automatically has two automatic rotary indexing prismatic pallets 400x400x840 mm in size. The pallets are indexed at 90° or 15° and are attached to a drum which can turn 180°. In the process of machining intermediate products mounted on one of the pallets, 12 intermediate products are placed manually on one of the prismatic pallets. After the intermediate products has been machined on the first pallet the drum rotates by 180° automatically with the pallets changing places. The pallet change takes 10 seconds. It takes 5 seconds to rotate each pallet by 90°. Intermediate products can be mounted on the pallets by industrial robots.

The Machine Tool Building Combine also manufactures models MC-630, MC-800, MC-100 and MC-1250 machining centers intended for high productivity machining of large intermediate products. These machine tools are equipped with devices for an automatic tool change with 50 or 100 tool magazines and with devices for the automatic changing of pallets. To machine especially large parts weighing up to 10,000 kg, the combine manufactures model MZ and MZP portal machining centers. They are equipped with devices for the automatic change of tools with 50, 60 or 100 tool magazines. The maximum diameter of a tool is 115 mm, 500 mm in length and 35 kg in weight.

At the exhibition, the Czechoslovakian machinebuilders demonstrated models MCSY 50A and MCSY 80A turning machining centers equipped with horizontal

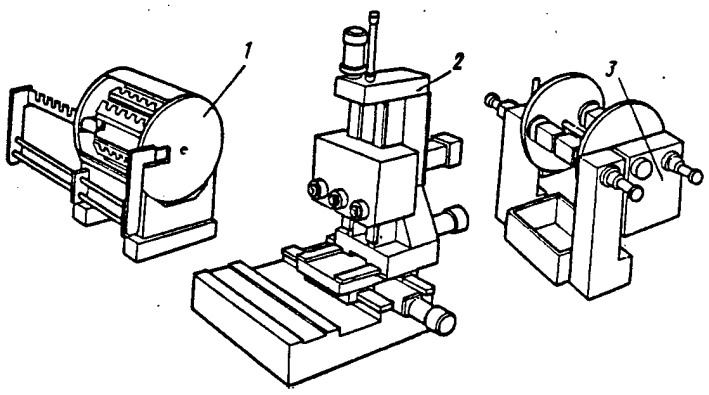


Fig. 1

rotation axis turrets (Fig. 2). Up to 14 tools can be mounted in the turret. Four rotary (drive) tools make it possible to machine fully various intermediate products 50 to 80 mm in diameter and up to 120 mm long on one machine tool. The machine has a tailstock, a spindle workhead and a chuck which clamps the machined part of the intermediate product when its second side is machined; it is also equipped with a rotary tool magazine and an automatic loading device.

The IVO Ribar (Yugoslavia) Machinebuilding Plant manufactures models 40, 50, 63, 80, 110 and 100L machining centers with horizontal spindles, equipped with automatic changes of tools and automatic changes of pallets. The first consists of a two-grip automatic loading device and a drum or vertical chain magazine with a capacity of 20, 40, or 60 tools weighing up to 7) kg (for the first three models) and up to 20 kg (for the remaining models), with lengths of up to 250 and 400 mm and with diameters of up to 125 and 160 mm respectively. The tool change takes 6 to 10 seconds. The device for changing pallets automatically consists of two auxiliary tables located to the right and left of the machine tool table. During the machining time of the intermediate product installed on one of the pallets on the machine tool table, the intermediate product is changed on the second pallet located on one of the auxiliary tables. The "Rapid 1" macining center has vertical and

horizontal spindles that permit the machining of the intermediate product on five sides with one setting. The modular system of the ILRFAM tool, manufactured by this plant consists of shanks, intermediate components and tool holders from which tools for various purposes can be composed (for drilling, reaming, rough and finish milling), of the required diameters and lengths. The modules are connected to each other by cylindrical collars and holes and are fixed by a spindle-nose key and slot and secured by screws.

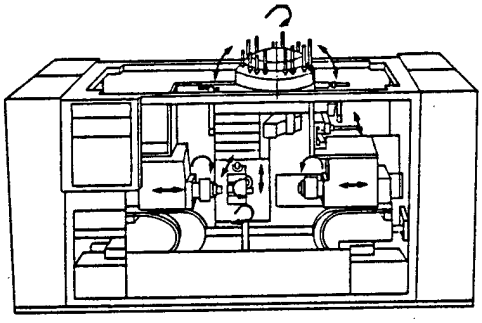


Fig. 2

2291
CSO: 1823/139

ARTICLE DESCRIBES HYDRAULIC-IMPACT DIE-FORMING PRESS

Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 10, Oct 85 p 23

[Article by V. Bibikov: "Water Extrudes...Titanium"]

[Text] Fifteen years ago, when the laboratory of the Applied Physics Institute of the Academy of Sciences of the BSSR, headed by V. N. Chachin (now rector of the Belorussian Polytechnical Institute), first began to experiment with pulsed extrusion methods, the methods were uncharted territory on the map of science. All that was known was that they allowed one to dispense with the ram--that indispensable component of expensive die equipment. This fact enhanced the tremendous advantage of such methods, since contemporary production uses extrusion to manufacture the components of millions of items.

In place of the ram they used everyday water; it only took 15 seconds for this reporter to be convinced of that fact. An operator placed a steel sheet on a square container and pressed a button. A deafening thud was heard, and instead of a flat blank, the container now held a part covered with water droplets. The part had bent edges, numerous complex depressions, and a perfectly round hole in its center.

Deputy lab director A. Skripnichenko, candidate of technical sciences, explained the basics of the operation:

"There is a flat-die piston at the top of a vertical thick-walled cylinder. Compressed air is contained in special pneumatic accumulators. This air is instantaneously "discharged" onto the flat die, which slams at high speed against water covering the blank and the lower die. For a split second the pressure in the work chamber can reach 3500 atmospheres. The energy of the impact is 25 kilojoules. Yet the installation is driven by a conventional factory pneumatic system with a pressure of 6 atmospheres."

The SFT 510 hydraulic-impact die-forming press developed by the Applied Physics Institute's collective is capable of machining blanks of unlimited length and having a width of up to 750 mm. It may also be used to shape tubular parts with a diameter of up to 320 mm and a height of up to 250 mm.

"By eliminating the traditional ram, we have been able to reduce expenditures of time and resources for extrusion tooling by a factor of 2 to 3," said V. N.

Chachin, academician of the Academy of Sciences of the BSSR, as he spoke about the achievements of the new equipment. "Moreover, in a number of cases we can make the lower die out of composite materials or even out of wood, instead of having to use expensive alloyed steel. Hydraulic-impact equipment uses 5-7 times less metal than conventional presses with the same power; it uses much less energy and takes up much less production space."

These advantages make hydraulic-impact technology irreplaceable in single-unit, small-lot, and serial production requiring a frequently varying range of parts. This specialized press can also be used successfully in large-scale serial production. But there is one field of application where hydraulic-impact die forming leaves the competition miles behind. As an example, suppose you need to form parts from pipe sections such that they have several enlarged segments whose diameter is 1.5 times greater than the original pipe section diameter. You simply cannot do this with a conventional press, but it is quite possible with the SFT 510.

Or consider this example: How can you use die forming to change a steel sheet into a part which has a deep drawing, e.g. a common drinking glass? Traditional technology would require 7-8 tooling arrangements in which the blank would be machined sequentially (and the blank must be annealed after every impact of the ram). With the hydraulic-impact method, it is enough to repeat the water "impact" 2-3 times without removing the blank from the press.

This is explained by the fact that water, in contrast to the rigid metallic ram, acts upon any point of the blank with equal force. For the same reason, titanium alloys and other hard alloys are subject to hydraulic-impact extrusion even though they are not ductile enough for machining in a traditional die.

In one of the installations, polyurethane was used in place of water. It turns out that this rubber-like substance can also be used to form steel. Moreover, it allows the installation to be simplified and to be made twice as "skinny." This new press has the designation SFT 514. It successfully performs all sorts of coining, shaping, and shearing operations, especially for machining materials which are hard to shape.

Both of the Belorussian scientists' creations have essentially no equivalents in the world; the SFT 514 was even awarded a gold medal at the international exhibition in Brno. In three short years, the use of presses manufactured by a pilot plant of the Academy of Sciences of the BSSR has had about a million rubles of positive economic impact.

Both models have successfully passed interdepartmental testing and have been recommended for serial production. Already 385 industrial enterprises have placed orders for this equipment. In 1985 an initial test-batch of presses with impact operation will be manufactured. Meanwhile the Applied Physics Institute's collective is working on a way to rig the presses up with a robot and thereby completely automate them.

12997/13045
CSO: 1823/110

OTHER METALWORKING EQUIPMENT

UDC 658.527.011.54: 621.979-82

MECHANIZED LINE FOR MANUFACTURING PARTS DESCRIBED

Moscow MASHINOSTROITEL in Russian No 1, Jan 86 p 11

[Article by I. V. Stepanishchev, engineer: "Mechanized Manufacturing Line"]

[Text] The Donetsk "DonPKTI" Institute developed a line (author's certificate 1005993) intended to mechanize the manufacture of parts and intermediate products for the PVI-125B starter on single-crankshaft and hydraulic presses.

The line is a complex of mechanisms with a controlled linkage. It contains the following which are installed in a technological sequence: feed 1, crankshaft press 3 for preliminary processing of parts, device 5 for the interoperational movement of parts and removal of waste, hydraulic press 7 for the further processing of parts and for the removal of the finished products. Conveyor 2 for the removal of stamped parts is located on bolster plate 3 of the crankshaft press. The feed and device for removing the finished products are mounted on running wheels on rails which makes it possible to roll them away when the dies are changed on the press.

The device for the interoperational movement of parts and removal of waste is made in the form of a roller conveyor consisting of two parts. On its first part which is directly behind the crankshaft press is mounted belt conveyor 4 obliquely within the frame which is intended to transfer parts stamped on the crank press. Pneumatic pusher 6 is located on the second part of the conveyor. It pushes finished parts out from under the die of hydraulic press 7. Both parts have ejectors: one ejects intermediate parts from the conveyor which were processed on the crankshaft press and also wastes from stamping parts, while the other one ejects parts issued by the oblique belt conveyor into packing boxes.

A device to remove waste is installed behind press 7 and consists of horizontal roller conveyor 8 and oblique belt conveyor 9 mounted in one frame. Conveyor 8 issues parts which remained on the surface of the die after stamping, while conveyor 9 issues parts stamped improperly.

When the line is in operation, the stack of intermediate products is placed on the feeder and they are pushed out sheet-by-sheet onto the roller conveyor from which the worker feeds them to the die. Wastes formed in the stamping fall through a window in the die onto a conveyor under the die and are removed to packing boxes.

The stamped part is moved from the press to the device for the interoperational movement of parts and sent to the hydraulic press for the next processing. After the completion of the operation on this press the part is pushed out into a device for the removal of parts and is moved to a stop, then the part is moved by a pusher into a cassette.

Parts stamped on the crankshaft press improperly are sent by the conveyor under the stamp and the oblique conveyor to the second part of the roller conveyor (up to the stop) and are removed into packing boxes by the pusher. If these parts are also processed on the hydraulic press, the stop ahead of the pusher is lifted and these parts are moved by the conveyor to the die for processing. The finished part falls through the die window onto the press table and is pushed by the pneumatic pusher onto the oblique belt conveyor from where it is sent to the packing box.

The wastes formed when there is improper stamping on the crankshaft press are pushed out into a device for the interoperational movement of parts and the removal of wastes. They are moved to the stop and the wastes are dropped into packing boxes.

Specifications

Productivity of line, pieces/hour	65 -150
Sizes of intermediate products, fed to line, mm	
length	1200-1800
width	400-600
thickness	3.9-6.0
Installed power, kw	13
Dimensions of line, mm	15,400x3500x2520
Weight, kg	9800

The proposed mechanized line increases the productivity of labor 1.5 to 2-fold. It is serviced by two people.

2291
CSO: 1823/139

OTHER METALWORKING EQUIPMENT

UDC 621.983.044.4.001

STATUS OF AND OUTLOOK FOR DEVELOPMENT OF ELECTROHYDRO-PULSE PRESSURE TREATMENT OF METALS

Moscow KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO in Russian No 1, Jan 86 pp 20-23

[Article by B.Ya. Mazurovskiy]

[Abstract] In 1975 a coordinating council was formed by the central management of Mashprom's (Machine Manufacturing Industry) scientific-engineering department, its tasks being to improve the technology of electrohydro-pulse pressure treatment for metals such as aliminum, copper, brasses, and plain carbon steels. At the All-Union scientific-technical conference held in 1984 in Nikolayev were discussed the major theoretical aspects of this treatment, proceedings of this conference having been published in the form of 13 articles in KUZNECHNO-SHTAMPOVOCHNOYE PROIZVODSTVO No 8, 1984. Monographs on this subject are regularly published by the Izd-vo Naukova Dumka. The major problem with generating high-pressure pulses of the order of 10^9 Pa amplitude at repetition rates of 0.1-10 Hz by high-voltage discharges in liquid is the correspondingly short deformation time and attendant local heat buildup within the region of slip planes. Limiting the action of this heat effect is not only important from the safety standpoint but also essential in terms of practicality. Various theories have been proposed and experimentally tested for systematic analysis of process mechanisms and their control. These mechanisms include excitation of elastic stress waves, relaxation of residual stresses by nonadditive buildup of strains and by decrease of the dislocation density under shear. An important insight was provided by Keller's theory of internal friction and string model. The corrosion resistance of welded steel joints is increased up to twentyfold by electrohydro-pulse pressure treatment. This treatment also raises the static strength of the metal 15-20 percent higher and the fatigue strength of the metal 2-4 times higher than does conventional heat treatment. It produces much more precise and reliable joints than does mechanical expansion. Model T1226 presses with 40 kJ energy storing capacity are already successfully used in production of tubular products, and an original design of model T1032 presses with 160 kJ energy storing capacity for treatment of flat heat-exchanger panels of sheet metal up to 650x3150 mm^2 in size with up to 30 mm deep corrugations has already been completed. A model T0226B press for treatment of cooling coils for frames of explosion-proof electric motors has also been designed, built, and put in operation. References 17: all Russian.

2415/12948
CSO: 1823/126

AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

CONTROL OF THE ROBOTIZED COMPLEX

Moscow SOTSIALISTICHESKIY TRUD in Russian No 11, Nov 85 pp 44-46

[Article by P. Susin, candidate of economic sciences, A. Osikov and N. Zavarzin (Scientific Organization of Labor Center of the Ministry of Heavy Machinery)].

[Text] The need for a change to fundamentally new technologies and to the most up-to-date methods was sharply emphasized at the April (1985) CPSU Central Committee Plenum and at a party central committee meeting. At this meeting Comrade M.S. Gorbachev stated that we must introduce a new means of bringing about revolutionary changes in production. This must represent the most advanced technology, based on the latest achievements of science and labor organization, and must be capable of producing maximum success. The speech particularly concerned modern robotized production complexes (RTK) and the new type of brigades needed to service them.

There are a number of engineering and organizational problems involved in the introduction of these complexes, including: preparing the RTK for startup; establishing standards for the number of workers required to operate, repair, service and refit the RTK; and establishing similar standards for the engineering/technical personnel who prepare technical documentation and programs as well as provide other services. The Scientific Organization of Labor Center of the Ministry of Heavy Machinery has studied the structure and tables of personnel organization for manufacturing complex servicing in our branch as well as in other branches and has developed "Typical Structures and Standards for Workers and Staff Engaged in the Operation and Servicing of Robotized Sections." This document can be used to determine the standard number of workers employed in categories at a complex. These categories are joined into brigades to assure interchangeability and the combination of professions, as well as to allow a volume of work to be carried out with fewer personnel. The brigades are assigned the production plan and the technical/economic plan with all the profitability indicators. The brigades are made up of process programming engineers, electronics technicians, operators, toolers, mechanical repair personnel and electrical repair personnel. A machine operator trained as mechanic may be included in the team if the tasking for this position is 100% in a particular robotized complex. A brigade is headed by a brigadier selected from among the engineers, programmers or electronics personnel. The brigade is responsible for all types of RTK maintenance and repair work during the year and during all subsequent periods.

The staffing standards for engineering/technical personnel and ancillary workers servicing the complexes or robotized sections were particularly hard to develop since there are still not enough statistical data to permit the establishment of differential standards on an item-by-item basis.

In collecting initial materials and research on RTKs in sector enterprises the organization of work and workstation servicing in robotized sections was studied and examinations were made of the technical characteristics of the equipment installed there, the list of work carried out, the duties of workers and professionals and diagrams of subunit and individual executive organizational subordination. This analysis defined the relationship between the volume of work performed and primary and secondary factors, as well as the degree to which this affected the number of workers and personnel required.

Standard structures were used to develop a system of subordination for subunits (individual executives) and a clear-cut distribution of work between individual branches, to define their rights and duties, to increase operational efficiency and the reliability and completeness of production flow monitoring and to provide continuous, high-quality technical servicing of robotized sectors. The typical personnel duty listing and structures provide for the organization of offices (groups) in the applicable enterprise subunits.

The design engineering office (group) for production process robotization is established in the production process automation and mechanization section. This unit is composed of an office chief, design engineers, design technicians, and category I, II and III production engineers. An industrial robot and manipulator design and programming group, consisting of process programming engineers and process programming technicians, is formed in the chief production technician's section (chief welder, chief metallurgist) in the office responsible for introducing numerical control [NC] machine tools (machines). A group assigned responsibility for robotized section equipment (consisting of repair and electronics engineers in addition to design engineers) is established in the chief mechanic's section (power engineering) in the NC machine tool repair and technical servicing office. The shop's production engineering office includes the post of executive in charge of introducing programs in the robotized section.

Various standard-shaping factors were considered in preparing the personnel requirement norms. For example, in the case of the production process robotization design engineering office there was the number of robotized production complexes and their complexity, expressed as the sum of repair complexity units for the equipment servicing the robotized section. For the industrial robot and manipulator programming and design group this factor was the number of programs developed for the robotized section and the number of RTKs. For the repair and technical servicing group the factor is the number of equipment repair complexity units and the number of RTKs. The basic tasks, functions and rights and duties of the newly organized subunits are contained in the corresponding standard conditions while rights and duties of executives are contained in their appointment instructions.

The operator duty factor and the number of physical units in the robotized complex are used as the determinant factors in the basic personnel requirement

standards. Standards have been set up for lathe operators, milling unit operators, turret lathe operators, reaming lathe operators, drill operators, furnace operators for metals and alloys, injection molding foundry workers, painters and automated welding machine operators. The standards for the number of workers required to service robotized production complexes (see the table) contain data for estimating the number of RTK fitters, operators, electricians and mechanics for every type of production based on equipment characteristics. The estimate is founded on the repair complexity of the equipment in use at the complex (lathes, presses, machines, robots, manipulators and their ancillaries). The volume of all types of basic equipment, robot, manipulator and device servicing as well as a listing and a volume accounting of RTK setup work were obtained by establishing time standards per repair complexity unit in the repair and preventive maintenance servicing of the RTK and during equipment setup operations.

When estimating the number of setup personnel needed to service an RTK, the type of production and the characteristic number of setup and retooling operations to be carried out by these personnel during a shift are considered. Because one of the factors that determines the number of setup personnel required is the type of equipment (lathes, milling machines, drill presses, various types of presses, etc.), the number of repair complexity units for the various units and their ancillaries must be considered. These values are then added and correction values are factored in for the various types of production to define the number of setup personnel. Of course, the system of standards must be revised as robotized sections and flexible systems develop.

It should be noted that in our opinion industrial robots must be standardized and state standards developed to lower the number of robot product lines, reduce the variation in robot designs and limit the colossal expenditure of state resources on their design and production. A large product line requires the development of all sizes of storage units, ancillary mechanisms and devices. It is very difficult for small plants without highly trained personnel and good tool shops to prepare these types of devices and consequently it will be difficult to introduce industrial robots. In our opinion, this country must have an institute in charge of creating not only robots but all the technical equipment they involve. This must be achieved in order for general purpose robotized devices and standardized devices to be introduced with minimal additional work at all enterprises with similarly structured production operations.

Also, technical preparations for production and actual production planning must be significantly improved so that robotized resources can be quickly and efficiently employed. This facilitates the preparation, production and introduction of control program libraries, the design and production of necessary tools and equipment not present in warehouses and the actual calendar planning of RTK tool requirements, as well as the estimation of equipment utilization. It also simplifies the development of flow charts for section product manufacture, shift tasking in terms of product loads and processing, and the preparation of tools, devices and control programs.

1 Пример определения численности наладчиков на роботизированных участках механообработки

2 Сумма единиц ремонтной сложности	4 Станки с ЧПУ								17 Токарные автоматы при диаметре обработки, мм			Токарные станки при диаметре обработки деталей, 21 мм		Токарные полуавтоматы 24
	5 Токарные при диаметре обработки, мм		8 Сверлильные при диаметре сверления, мм			12 Фрезерные 16								
						с торцовыми 13 фрезами		с цилиндрическими фрезами						
	6 до 400	7 свыше 400	9 до 12	свыше 12 до 25 10	свыше 25 11	до 125 14	свыше 125 15		до 10 18	свыше 10 до 20 19	свыше 20	до 400 22	свыше 400 23	
50	0,16	0,18	0,12	0,14	0,16	0,15	0,24	0,08	0,14	0,17	0,21	0,09	0,11	0,14
70	0,23	0,26	0,17	0,20	0,22	0,20	0,33	0,11	0,20	0,24	0,30	0,12	0,15	0,19
90	0,29	0,33	0,22	0,25	0,28	0,26	0,42	0,14	0,25	0,30	0,38	0,16	0,20	0,25
150	0,48	0,55	0,37	0,42	0,47	0,44	0,70	0,23	0,42	0,50	0,63	0,26	0,33	0,41
200	0,65	0,73	0,50	0,56	0,62	0,58	0,94	0,30	0,56	0,67	0,85	0,35	0,44	0,55
250	0,81	0,92	0,62	0,70	0,77	0,73	1,17	0,38	0,70	0,84	1,06	0,44	0,55	0,69
300	0,97	1,10	0,74	0,84	0,93	0,87	1,41	0,45	0,84	1,00	1,27	0,53	0,66	0,83
350	1,23	1,28	0,88	0,98	1,09	1,02	1,64	0,53	0,98	1,17	1,48	0,61	0,77	0,96
3 и т. д.														

1. Example of the definition of the number of repair personnel needed in robotized machining sections
2. Total repair complexity units
3. etc.
4. NC machine tools
5. Lathes -- machining diameter in mm
6. to 400
7. above 400
8. Drill presses -- bore diameter in mm
9. to 12
10. above 12 to 25
11. above 25
12. Milling machines
13. face milling
14. to 125
15. above 125
16. cylindrical milling
17. Automated lathes -- machining diameter in mm
18. to 10
19. above 10 to 20
20. above 20
21. Lathes -- machining diameter in mm
22. to 400
23. above 400
24. Semiautomated lathes

The repair complexity of each piece of equipment or ancillary device must be known in order to estimate the number of personnel required for repair and preventive maintenance operations in the robotized production complex. Unfortunately this factor has not been established by design institutes and each enterprise must develop its own values. This leads to inconsistencies in the repair complexity values and thus differing personnel requirements at identical complexes or in identical flexible production complexes. In our

opinion repair complexity categories should be estimated for all domestic and foreign robots and for all ancillary equipment, just as is done for all metal-cutting equipment in the USSR by the Experimental Scientific Research Institute for Metal-Cutting Machine Tools.

12746
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AUTOMATED LINES AND AGGREGATED MACHINING SYSTEMS

BRIEFS

MACHINEBUILDING ASSOCIATION PRODUCTION RAISED--Leningrad (TASS)--The special design bureau of the Precision Machine-Tool Association imeni Ilyich developed about 90 new machine models in the 11th Five-Year Plan. The "development-implementation" cycle was reduced 1.4-fold. In the 12th Five-Year Plan, a course has been taken for an even shorter assimilation period for new, improved equipment. The SKB [special design bureau] collective is designing grinders, lathes and microfinishing (lapping) machines intended for the manufacture of especially precise parts. The possibilities of using them in flexible production lines are being investigated. In the photos [not reproduced]: A.S. Kartyshev, one of the association's leading specialists in the development of measuring apparatus for flexible production modules; in a thermocontrolled shop, assembly of grinding machines for the processing of instrument ball bearings. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 5, Jan 86 p 13] 12461

CHERBOKSARY PRODUCTION ASSOCIATION IMPROVEMENTS--Cheboksary--Gamma, a new information-computer complex, has been put into lot production at the Cheboksary Production Association Elektropribor. They are designed for the delivery of complex diagnostic data, with the help of which physicians will be able operatively to determine the state of health of their patients. Gamma is only one of the innovations that should be assimilated in the 12th Five-Year Plan by the collective, which for the past year's results was awarded the Red Challenge Banner of the TsK KPSS [CPSU Central Committee], USSR Council of Ministers, VTsSPS [All-Union Central Council of Trade Unions] and TsK VLKSM [All-Union Komsomol Central Committee]. Soon the enterprise will begin, based on microprocessors, making units of hardware components for the telecontrol of complex equipment at metallurgical enterprises. In the new five-year plan, as before, it has been resolved to fill all orders in accordance with contractual conditions. A number of brigades have undertaken to complete their two-month assignments by the opening day of the 27th CPSU Congress. This year the collective plans to produce no less than a half-million rubles worth of production in excess of the program. The reconstruction of the enterprise continues. Automated lines are becoming operative. Dozens of robots and manipulators are already operative. A construction site is being prepared on which an engineering-welfare complex will go up. In it will be housed design and technological services, space for technological studies for the production workers, and a cafeteria. [By PRAVDA part-time correspondent Yu. Knyazev] [Text] [Moscow PRAVDA in Russian 6 Feb 86 p 1] 12461

INNOVATIONS AT MINSK PLANT--(TASS)--The collective of the Minsk Scientific-Production Association Granat is successfully solving the problem of the manufacture and widespread utilization of independently developed industrial robots, flexible production systems and, potentially, automated shops and plants. In the photo [not reproduced]: Operator V. Derag adjusts a flexible automated module. [Text] [Moscow SELSKAYA ZHIZN in Russian 11 Dec 85 p 2] 12461

IMPROVEMENTS AT IZHORSK PLANT--More than 200 creative brigades are involved in the installation of new equipment at the Izhorsk Plant Association. They were set up and are operating under the direct participation of the Council of Scientific-Technical Society (NTO) of the machine-building industry. What are the results of the activity of the enterprise's workers and engineers that are members of this public organization? Yesterday at the plenum of the Leningrad board of the NTO of the machine-building industry they presented a solid list of the operations carried out by the Izhorsk members of the society. They are: design of a flexible production system, and certification of work stations, in the course of which were brought to light 1300 units of underutilized and obsolete equipment, and the implementation of progressive technological processes. It is notable, that all this work in the association is connected in the most direct way with the realization of the "Intensification-90" program. This year alone the economic effect of the work presented at the concourse by society members exceeded 20 million rubles. [By S. Borisov] [Text] [Leningrad LENINGRADSKAYA PRAVDA in Russian 4 Dec 85 p 2] 12461

AUTOMATION AT MINSK PLANT--In the years of the current five-year plan, the Minsk Production-Technical Association has implemented 600 robot-manipulators, systematically automated 11 shops and 23 sectors, and put on line a flexible production line for the assembly of an electronic block clock. An independent machine-building base allows for the solution of technical retooling problems in the association. In the 12th Five-Year Plan production of special technological equipment is scheduled to grow three-fold, and the volume of production two-fold, the growth of production being secured with operational capabilities, without increasing the number of workers. For the achievement of these goals a large backlog has been established. Annual obligations [as printed] [Excerpt] [Moscow GOLOS RODINY in Russian No 51, Dec 85 p 2] 12461

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PROCESS CONTROLS AND AUTOMATION ELECTRONICS

UDC 621.9.06-529

SYNTHESIS OF CONTROL ALGORITHM FOR GEARBOX OF MACHINE TOOL WITH NUMERIC PROGRAM CONTROL

Moscow STANKI I INSTRUMENT in Russian No 1, Jan 86 pp 8-9

[Article by Ye.A. Chernov]

[Abstract] The control algorithm for gearboxes of machine tools with numeric program control and automatic change of tool bits is encoded according to the speed chart and then synthesized, a typical example being the model GF17000 cantilever-type milling machine with an induction-motor drive and an 18-speed gearbox (40-2,000 rpm) controlled by electromagnets. The decoder circuit and the control-pulse generating-shaping circuits with capacitive delay lines where necessary are designed to implement the algorithm in accordance with the appropriate cyclogram. Various schemes are suitable for this purpose and the gearbox control can be automated with use of contactless electrical devices, which require automatic initial setting of triggers. Figures 5; tables 1; references 1: Russian.

2415/9365
CSO: 1823/124

PROCESS CONTROLS AND AUTOMATION ELECTRONICS

UDC 621.923-52

SYSTEM BASED ON 'ELEKTRONIKA MK-56' MICROCALCULATOR FOR AUTOMATIC CONTROL OF GRINDING PROCESSES

Moscow STANKI I INSTRUMENT in Russian No 1, Jan 86 pp 12-13

[Article by V.I. Svirshchev and V.N. Zuyev]

[Abstract] A system for automatic control of plane grinding has been developed at the Perm Polytechnic Institute which uses the small and easy to handle "Elektronika MK-56" programmable microcalculator. It is designed for model ZG71 and similar grinding machine tools produced at the Orsha manufacturing plant "Krasnyy Borets." The control algorithm is constructed to ensure a nondefective (scorchless) surface layer at maximum productivity of the grinding process, for which the microcalculator is programmed to compute the depth of cut on each i-th pass $h_i = \alpha_{i-1} h_{i-1} (1+\alpha_i)^{-1} [1-k_i/(c+k_i)]^{-1}$ (α, k - defectability index and machinability index of ground material, c - stiffness of machine tool) as well as the number of passes necessary from grinding away the allowance. The control hardware includes a storage-and-display of the sign of numbers, consisting of a diode-transistor NAND gate, a memory, and a control-signal generator. Standard hardware are an on-off switch, three hermetic-contactor relays, a servo relay, a transformer, a 4-diode rectifier, and a reversible servomotor coupled to the depth setting dial. This automatic control system was tested in a ZG71 grinding machine tool with a PP 250x75x25 24A25NSM16K5 wheel. Blocks of 12Cr2Ni4A steel 150 mm long and 50x20 mm^2 in cross-section, Rockwell C hardness not less than 60, were ground with the wheel covering 12 m/min and the table fed transversely 2.4 mm/pass till an 0.3 mm thick allowance layer had been removed. The system was found to be stable and reliable. Figures 1.

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END